Global macroeconomic impact of structural reforms in the G20

Banque de France

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June 1st 2015
Objectives

Use

- productivity shocks generated from potential structural reforms as calibrated by G. Cette et alii (2014)
- a widely policy used macroeconometric model (NiGEM)

To:

Identify and quantify macroeconomic impacts of potential structural reforms

Focus on the medium term (5 years) impact of these reforms: an horizon consistent with political cycles (and the G20 growth strategies)

Understand, identify and quantify international spillovers of these reforms
Use productivity shocks generated from potential structural reforms

- Deregulation of good and labour markets
- Best practice (mean of 3 lowest OECD indices of the sector)
- TFP shocks

Method used: Cette, Mairesse, Lopez (2014)
Extended for all G20 countries in NiGEM (excluding Argentina and Saudi Arabia)
Use NiGEM
a broadly used macroeconometric multi country model

Long run
CES production function for most economies (Cobb Douglas for few others)

\[ Q = \gamma [s(K)^{-\rho} + (1-s)(Le^\lambda)^{-\rho}]^{-1/\rho} \]

Short run: demand-driven dynamics
and use of error-correction model

Rational expectations
Forward looking exchange rates/long interest rates/wages/equity prices

Default policy options (endogenous monetary and fiscal responses)
Monetary policy (Inflation targeting rule)
Flexible exchange rate (UIP condition)

World general equilibrium model
Trade and financial channels
Outline of the presentation

1. Productivity shock in a single country: heterogeneous responses
2. Non anticipated productivity shock: importance of credibility
3. Spillovers analysis of productivity shocks: a 3-step approach
4. Spillovers analysis with cross-reforms
5. Discussion of the results
1. Productivity shock in a single country: heterogeneous responses

2. Non anticipated productivity shock: importance of credibility

3. Spillovers analysis of productivity shocks: a 3-step approach

4. Spillovers analysis with cross-reforms

5. Discussion of the results
Impact of a productivity shock in a single country

**Firms cut prices**
- gradual disinflation
- real exchange rate depreciation

**Firms target higher production**
- employment ↓ (in short run as labour productivity increase)
- investment ↑
And real (PPI deflated) wage ↑ with productivity

**Mix of different effects on growth**
- investment dynamics
- net exports benefit from real exchange rate depreciation but suffer from domestic demand growth
- consumption benefits from higher real wages but suffers from lower employment (and higher unemployment), positive net effect

**Output response**

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Productivity shock in a single country
1% increase, spread over 25 years

Response after 5 years, pct change from baseline

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>UK</th>
<th>Japan</th>
<th>France</th>
<th>Germany</th>
<th>Spain</th>
<th>Brazil</th>
<th>China</th>
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</thead>
<tbody>
<tr>
<td>GDP</td>
<td>0.19</td>
<td>0.25</td>
<td>0.12</td>
<td>0.07</td>
<td>0.09</td>
<td>0.14</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>Investment</td>
<td>0.57</td>
<td>0.83</td>
<td>0.56</td>
<td>0.34</td>
<td>0.49</td>
<td>0.64</td>
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<tr>
<td>Consumption</td>
<td>0.12</td>
<td>0.14</td>
<td>0.03</td>
<td>0.01</td>
<td>0.04</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Exports</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.05</td>
<td>-0.06</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Output gap</td>
<td>-0.02</td>
<td>0.00</td>
<td>-0.08</td>
<td>-0.06</td>
<td>-0.09</td>
<td>-0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>0.01</td>
<td>0.00</td>
<td>0.03</td>
<td>0.07</td>
<td>0.03</td>
<td>0.03</td>
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<tr>
<td>REER</td>
<td>-0.16</td>
<td>-0.27</td>
<td>-0.05</td>
<td>-0.11</td>
<td>-0.17</td>
<td>-0.06</td>
<td>-0.39</td>
<td>-0.17</td>
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<tr>
<td>CPI</td>
<td>-0.12</td>
<td>-0.08</td>
<td>-0.09</td>
<td>-0.09</td>
<td>-0.12</td>
<td>-0.07</td>
<td>-0.40</td>
<td>-0.18</td>
</tr>
<tr>
<td>Real Wages</td>
<td>0.10</td>
<td>0.06</td>
<td>0.08</td>
<td>0.03</td>
<td>0.04</td>
<td>0.12</td>
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</tbody>
</table>

strong heterogeneity
Reasons for heterogeneous macroeconomic response to productivity shocks

<table>
<thead>
<tr>
<th>Driver during transition dynamics</th>
<th>Key parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment</strong></td>
<td></td>
</tr>
<tr>
<td>Desired capital stock</td>
<td>Adjustment speed of capital stock, output gap</td>
</tr>
<tr>
<td><strong>Net exports</strong></td>
<td></td>
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<tr>
<td>Real exchange rate depreciation</td>
<td>Degree of trade price flexibility</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td></td>
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<tr>
<td>Income</td>
<td>Price elasticity of trade</td>
</tr>
<tr>
<td>Employment</td>
<td>Speed of real wage adjustment to labour productivity</td>
</tr>
<tr>
<td>Unemployment</td>
<td>Speed of labour adjustment to output</td>
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<td></td>
<td>Slope of the Phillips curve</td>
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</tbody>
</table>
1. Productivity shock in a single country: heterogeneous responses

2. Productivity shock with backward looking agents

3. Spillovers analysis of productivity shocks: a 3-step approach

4. Spillovers analysis with cross-reforms

5. Discussion of the results
Productivity shock in the US with backward looking agents

1% increase, spread over 25 years

Smaller investment response

Outline the importance of the credibility of reforms

Investment with forward looking agents

Investment with backward looking agents

pct change from baseline
1. Productivity shock in a single country: heterogeneous responses

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International spillovers analysis: a three-step approach

Step 1
1% productivity shock in one country over 25 years

Step 2
1% productivity shock in all G20 countries over 25 years

Step 3
Asymmetric productivity shocks in G20 countries (size of the shock depending of the distance to best performers Cette & al. 2014) over 25 years

Size of shock (GDP %)

<table>
<thead>
<tr>
<th></th>
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<th>ESP</th>
<th>BRE</th>
<th>CHI</th>
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</thead>
<tbody>
<tr>
<td>Size</td>
<td>2%</td>
<td>1%</td>
<td>5%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>
International spillovers analysis: main potential channels on GDP growth

- **Foreign demand**: Increase in domestic demand (investment mainly) of reforming countries
- **Competitiveness**: REER depreciation of reforming countries
  - Increase of competitiveness in partner countries
  - Negative spillover on net exports
- **Domestic prices**: Consumption rises with imported disinflation
- **Technology**: Productivity spillovers through technological catch up (not modeled in NiGEM)
International spillovers: positive but heterogeneous

Response normalized by size of domestic shock

GDP

- Individual
- Symmetric
- Asymmetric

USA | UK | JAP | FRA | ALL | ESP | BRE | CHI
Understanding heterogeneous international spillovers: diverging responses from net exports

Response normalized by size of domestic shock

Net exports in UK strongly benefits from the boost in external demand
Understanding heterogenous international spillovers: diverging responses from consumption and prices

Response normalized by size of domestic shock

Consumption in US strongly benefits from imported disinflation
Asymmetric productivity shocks in G20 countries

### Size of shock over 25 years (GDP %)

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<tr>
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<tr>
<td>2%</td>
<td>1%</td>
<td>5%</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
<td>10%</td>
<td>10%</td>
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</table>

### Response after 5 years, pct change from baseline

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<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GDP</strong></td>
<td>1.00</td>
<td>0.56</td>
<td>1.48</td>
<td>0.79</td>
<td>0.82</td>
<td>1.04</td>
<td>1.02</td>
<td>0.95</td>
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<tr>
<td><strong>Investment</strong></td>
<td>2.17</td>
<td>1.11</td>
<td>4.45</td>
<td>2.31</td>
<td>3.10</td>
<td>3.77</td>
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</tr>
<tr>
<td><strong>Consumption</strong></td>
<td>1.07</td>
<td>0.27</td>
<td>1.10</td>
<td>0.26</td>
<td>0.71</td>
<td>0.40</td>
<td></td>
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</tr>
<tr>
<td><strong>Net Exports</strong></td>
<td>-0.17</td>
<td>0.15</td>
<td>-0.24</td>
<td>0.00</td>
<td>-0.33</td>
<td>-0.15</td>
<td>0.49</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Output gap</strong></td>
<td>0.33</td>
<td>0.13</td>
<td>0.07</td>
<td>-0.23</td>
<td>-0.43</td>
<td>-0.15</td>
<td></td>
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<tr>
<td><strong>Unemployment</strong></td>
<td>-0.15</td>
<td>-0.13</td>
<td>0.08</td>
<td>0.33</td>
<td>0.07</td>
<td>0.04</td>
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</tr>
<tr>
<td><strong>REER</strong></td>
<td>0.63</td>
<td>0.02</td>
<td>0.73</td>
<td>-0.60</td>
<td>-0.75</td>
<td>-0.22</td>
<td>-3.48</td>
<td>-1.23</td>
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<tr>
<td><strong>CPI</strong></td>
<td>-0.44</td>
<td>0.04</td>
<td>-0.08</td>
<td>-0.21</td>
<td>-0.30</td>
<td>0.09</td>
<td>-4.21</td>
<td>-1.84</td>
</tr>
<tr>
<td><strong>Real Wages</strong></td>
<td>0.53</td>
<td>0.19</td>
<td>0.66</td>
<td>0.19</td>
<td>0.41</td>
<td>0.68</td>
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</tbody>
</table>
1. Productivity shock in a single country: heterogeneous responses

2. Non anticipated productivity shock: importance of credibility

3. Spillovers analysis of productivity shocks: a 3-step approach

4. Interaction of reforms: adding a labour participation shock to a productivity shock

5. Discussion of the results
Labour Force participation rate (LFPR) shocks
1% increase, spread over 25 years

In a single country

Response after 5 years, pct change from baseline

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<th>GE</th>
<th>IT</th>
<th>AU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Force</td>
<td>0.25</td>
<td>0.23</td>
<td>0.24</td>
<td>0.26</td>
<td>0.24</td>
<td>0.28</td>
<td>0.29</td>
</tr>
<tr>
<td>Capital stock (equilibrium)</td>
<td>0.11</td>
<td>0.12</td>
<td>0.10</td>
<td>0.10</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>GDP</td>
<td>0.13</td>
<td>0.15</td>
<td>0.09</td>
<td>0.06</td>
<td>0.06</td>
<td>0.08</td>
<td>0.06</td>
</tr>
</tbody>
</table>

- Responsiveness of GDP to changes in labour force and equilibrium capital (CES production function where capital adjust to labour supply shocks) varies across countries, with US & UK at the top and a low pass-through in France and Germany.
- Differences explained by the (estimated) accelerator effect, comparatively lower in France than in the US or UK.

Synchronized

Response after 5 years, pct change from baseline

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Labour Force</td>
<td>0.25</td>
<td>0.23</td>
<td>0.24</td>
<td>0.26</td>
<td>0.24</td>
<td>0.28</td>
<td>0.29</td>
</tr>
<tr>
<td>Capital stock (equilibrium)</td>
<td>0.11</td>
<td>0.11</td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>GDP</td>
<td>0.14</td>
<td>0.16</td>
<td>0.11</td>
<td>0.09</td>
<td>0.08</td>
<td>0.11</td>
<td>0.08</td>
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</table>

% of isolated shock

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<tr>
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<th>IT</th>
<th>AU</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>5.6</td>
<td>6.6</td>
<td>17.4</td>
<td>43.5</td>
<td>35.8</td>
<td>35.4</td>
<td>32.0</td>
</tr>
</tbody>
</table>

- Spillovers higher in countries where single shock impact is weak (France, Germany)
Positive spillovers of productivity and LFPR shocks
1% increase spread over 25 years (productivity and participation rate) in all countries
1. Productivity shock in a single country: heterogeneous responses

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3. Spillovers analysis of productivity shocks: a 3-step approach

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5. Discussion of the results
Main results

- Reform in a single country
  - Short- to medium-term impact is shaped by demand response
  - Several channels: their importance is highly dependent on national economic structure
  - Very heterogeneous impact across countries depending on their degree of flexibility

- Simultaneous reforms in several countries
  - Spillovers are globally significant and positive but heterogeneous across countries
  - When the size of productivity shocks reflect distance to best performers, positive spillovers are more important for flexible economies (often the same ones that are best performers and get the smallest productivity shocks)
  - Positive spillovers when synchronous productivity and LFPR shocks
Caveats and work ahead

- Sensitivity to NiGEM structure
  *e.g. productivity gains generated partially generated by sectoral recomposition while NiGEM is a one sector model, no exogenous productivity spillover in NiGEM*

- “Reduced-form” view of structural reforms (effect on productivity only)
  *e.g. estimated impact might already include some positive effect of net exports on demand*

- Abstract from possible changes in structure (Lucas’ critique)
  *e.g. reforms might also change slope of Phillips curve and affect transitory dynamics*

Results likely to be very sensitive to some key parameters as:
- adjustment speed of capital stock
- exchange rate pass-through to trade prices
- slope of Phillips curve (possible downward trend rigidities)

- Sensitivity to cyclical conditions of outcome of structural reforms deserve further work, including at ZLB
What did we learn?

- Distance to “best practices” differs across countries

- Very heterogeneous responses to productivity shocks across countries shaped by their degree of flexibility

- Short- to medium-term impacts are shaped by demand response. Possible short run pain (e.g. unemployment)

- Positive international spillovers when productivity gains are synchronous. Positive international spillovers benefit more to flexible economies

- Potential productivity impact of structural reforms shaped by distance to best practices

- Productivity gains are more efficient in a flexible economy

- Positive second round effect of structural reforms?

- Labour and product market reforms could be supported by demand side policies or increase of labour participation rates

- Scope for coordination of structural reforms

- Possible third round effect of structural reforms